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(54) **WORK VEHICLE**

USPC 180/291, 296, 299, 300, 309
See application file for complete search history.

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F01N 3/035 (2006.01)

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CPC **E02F 9/0866** (2013.01); **F01N 3/035**
(2013.01); **E02F 9/0808** (2013.01)

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CPC B60K 5/12; B60K 5/1208; B60K 5/1216;
B60K 13/00; B60K 13/04

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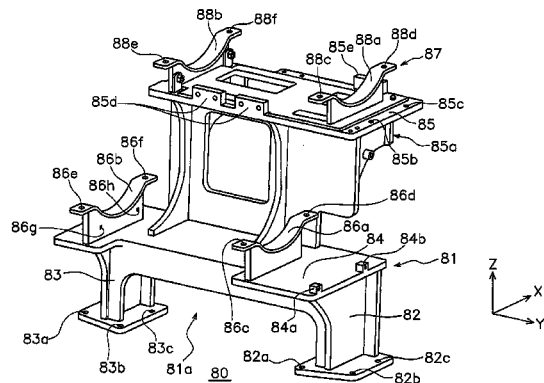
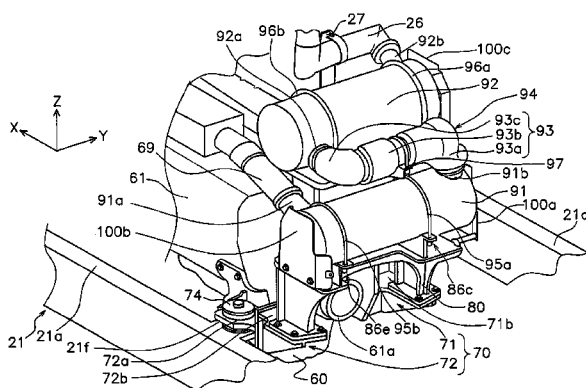
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(57) **ABSTRACT**

A work vehicle includes an engine, a diesel particulate filter
apparatus, a connecting pipe, and a selective catalytic reduc-
tion apparatus. The diesel particulate filter apparatus treats
exhaust from the engine. The connecting pipe connects the
engine and the diesel particulate filter apparatus. The con-
necting pipe extends obliquely downward toward the diesel
particulate filter apparatus from a connecting position with
the engine. The selective catalytic reduction apparatus treats
the exhaust from the engine. The selective catalytic reduction
apparatus is arranged above the connecting pipe.

15 Claims, 9 Drawing Sheets



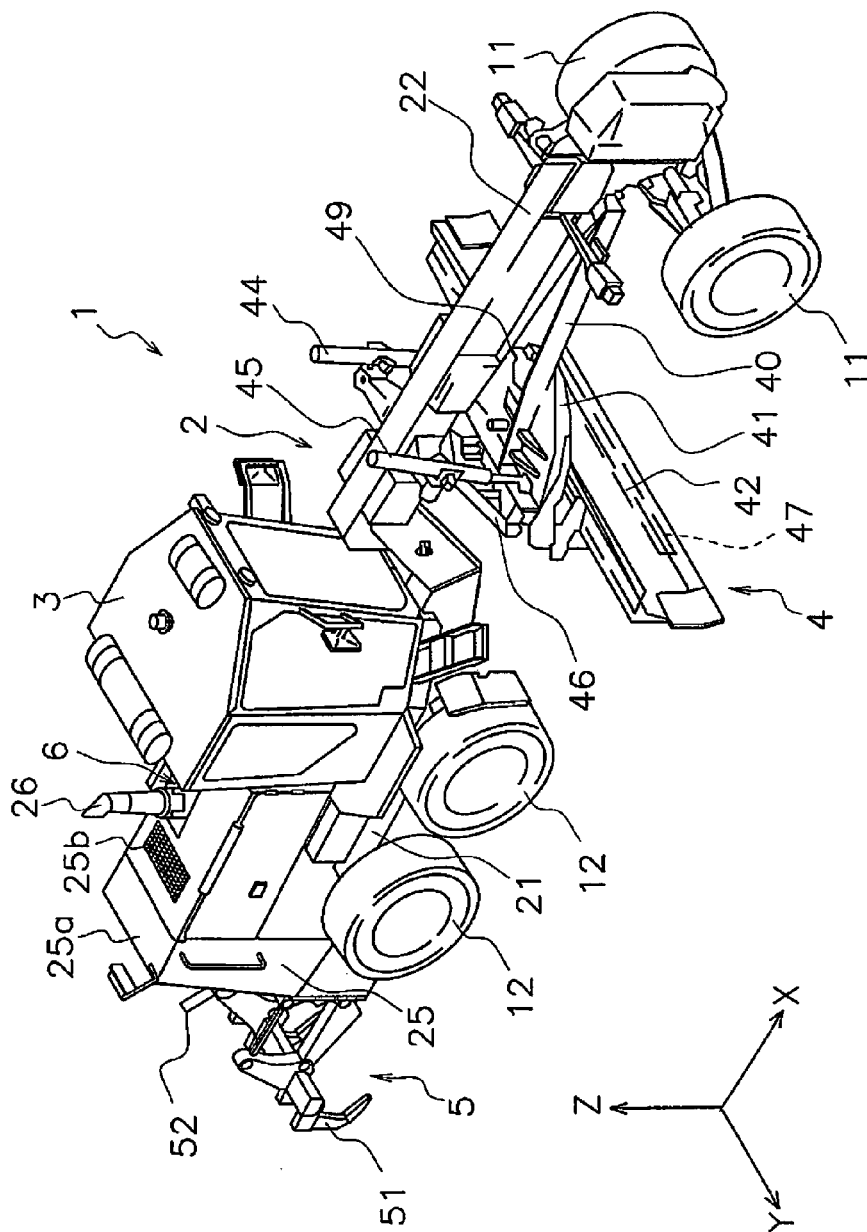


FIG. 1

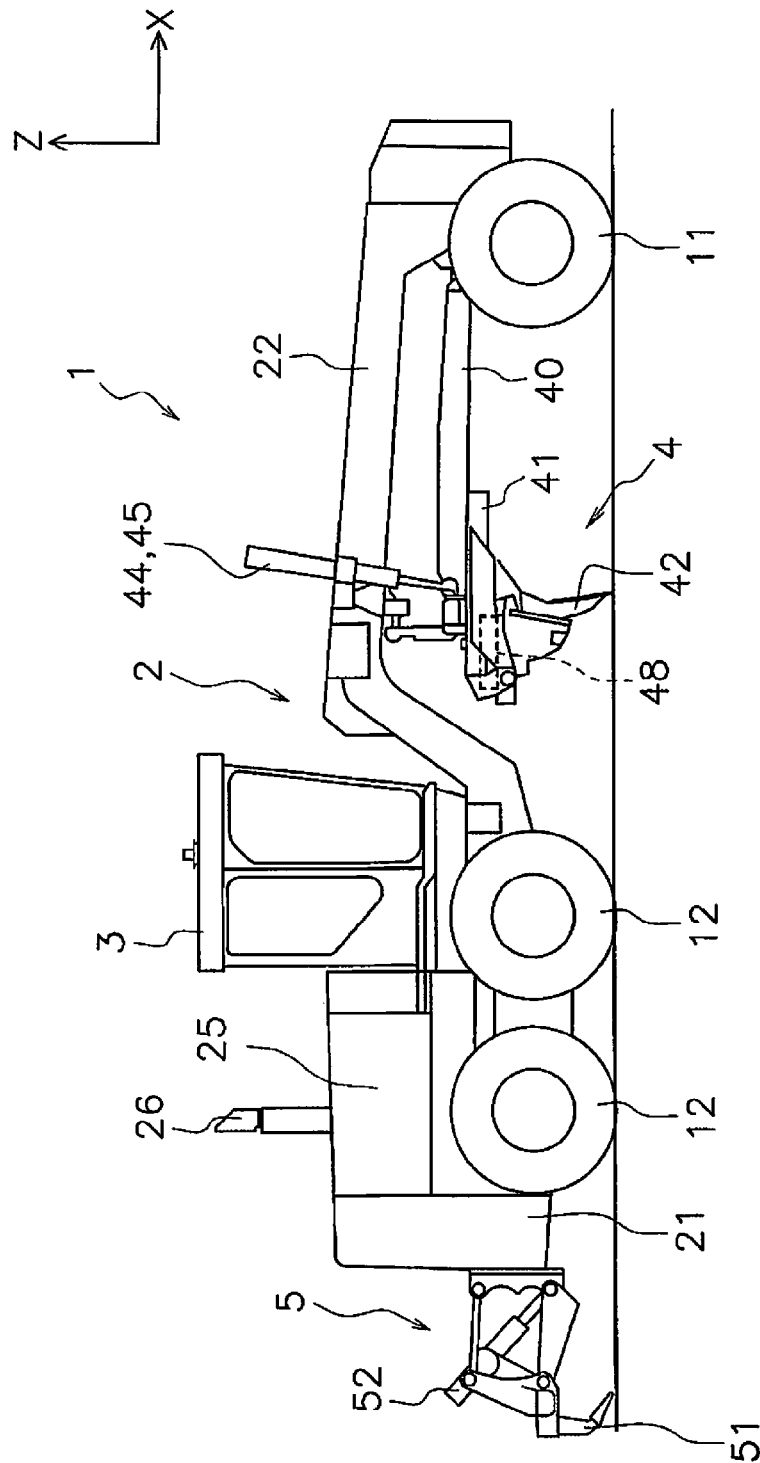


FIG. 2

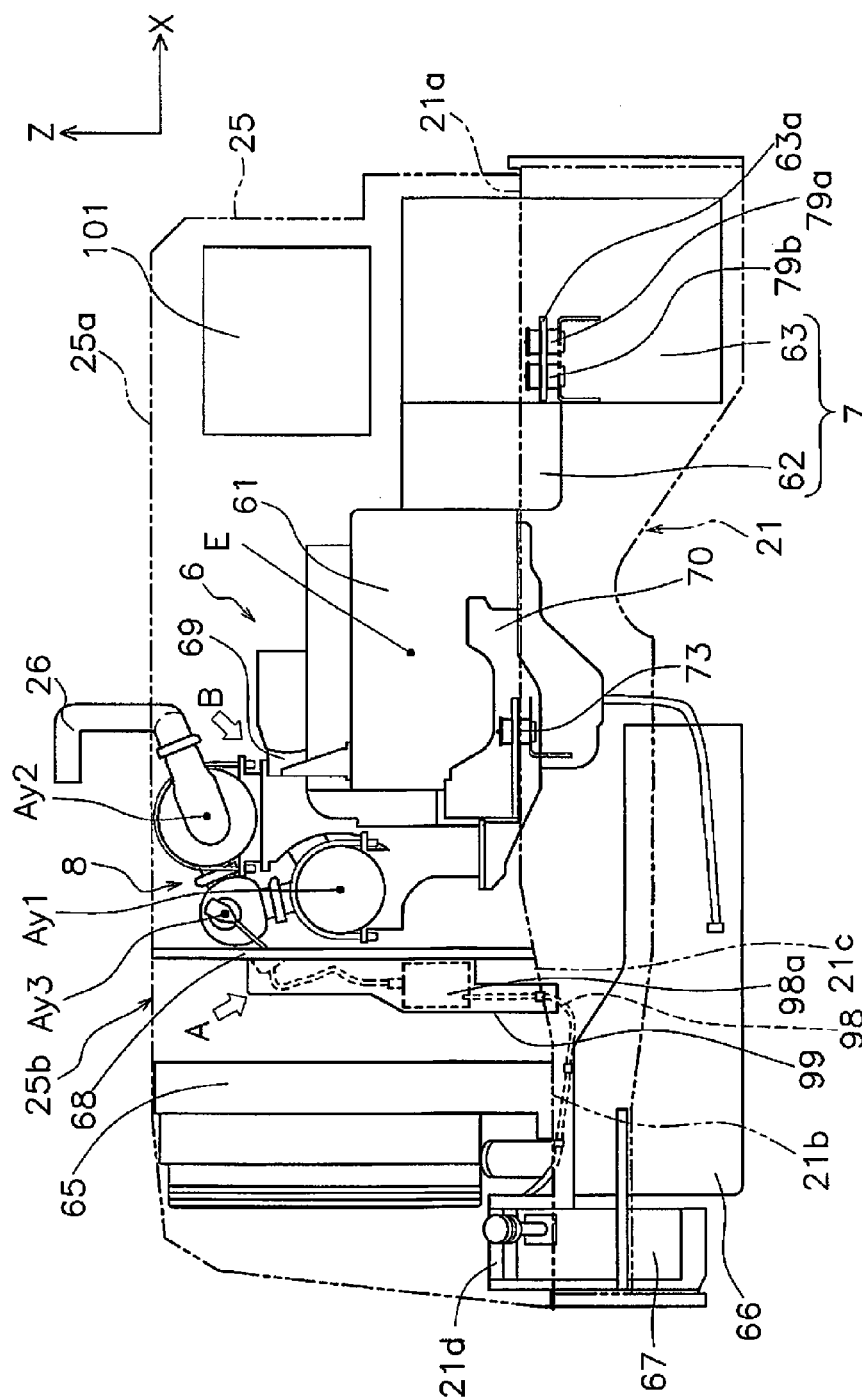


FIG. 3

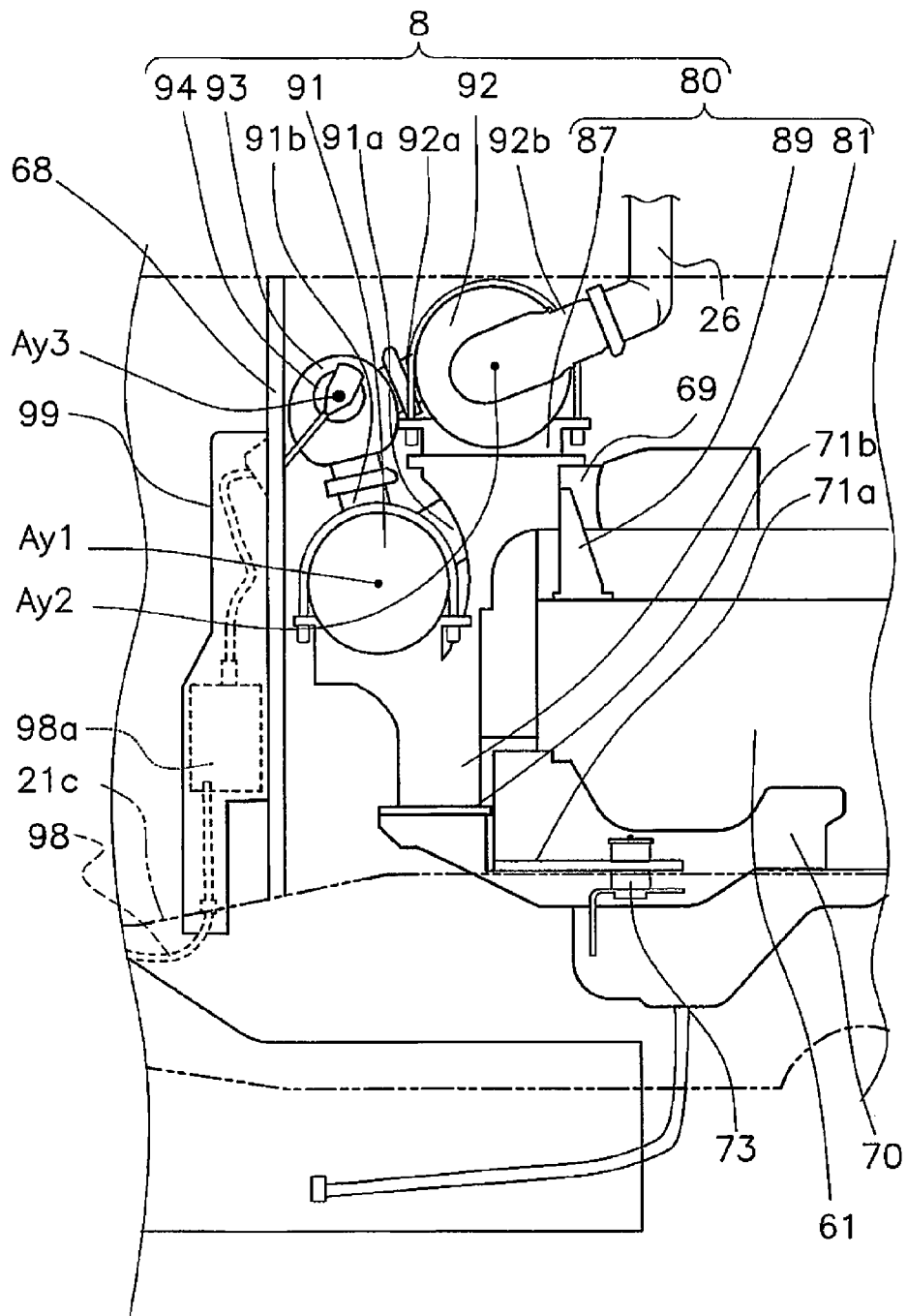


FIG. 4

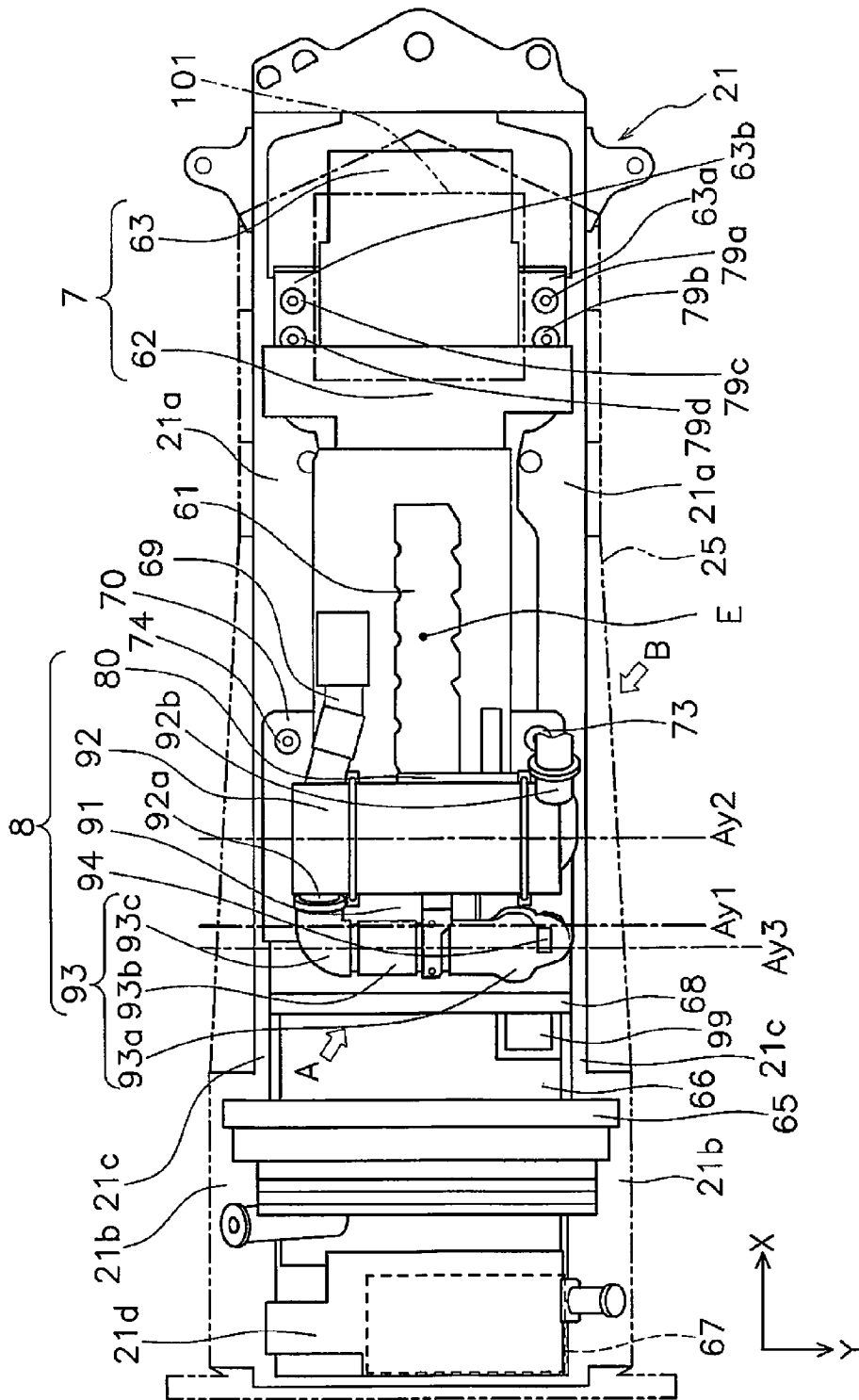


FIG. 5

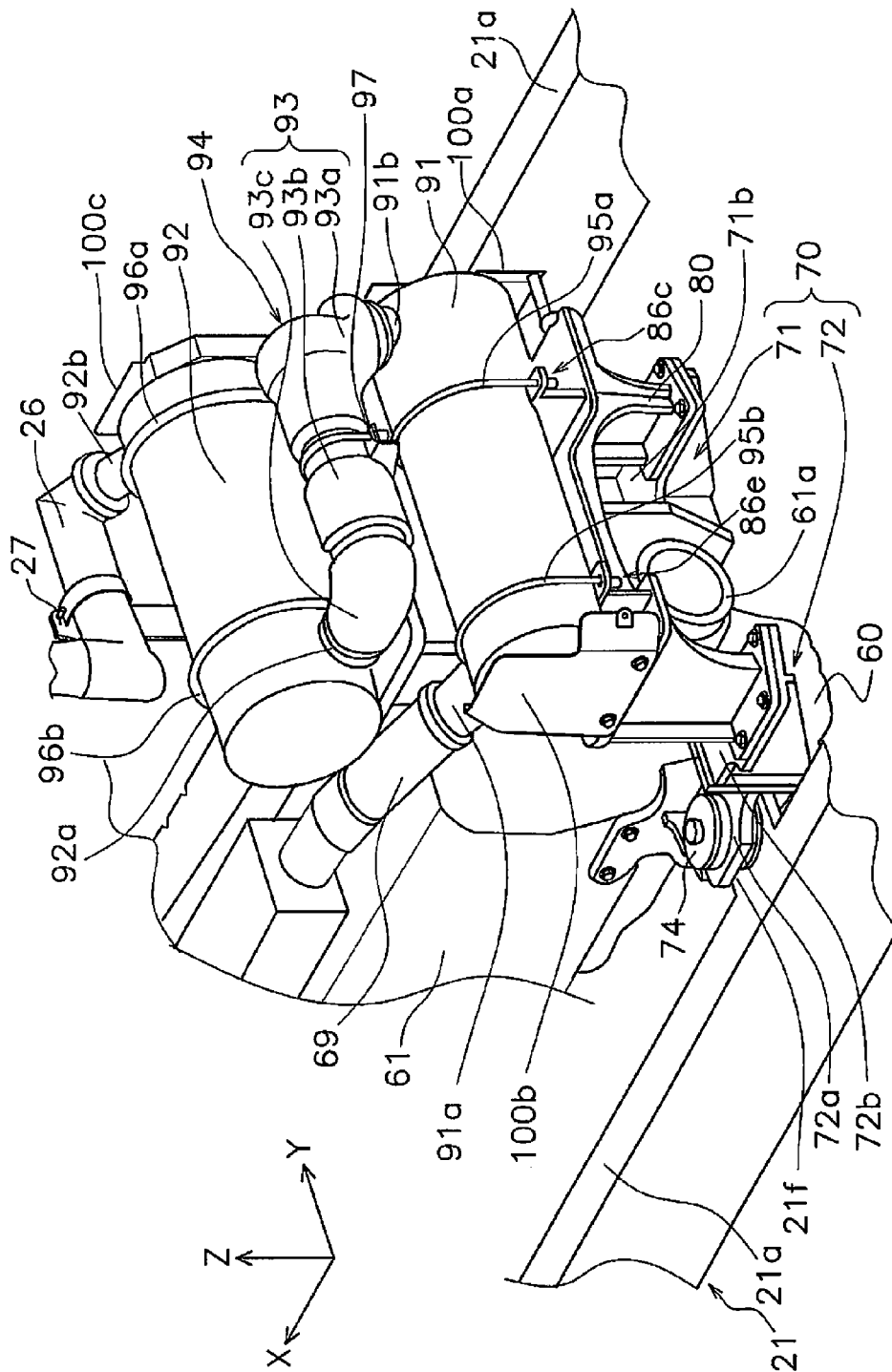


FIG. 6

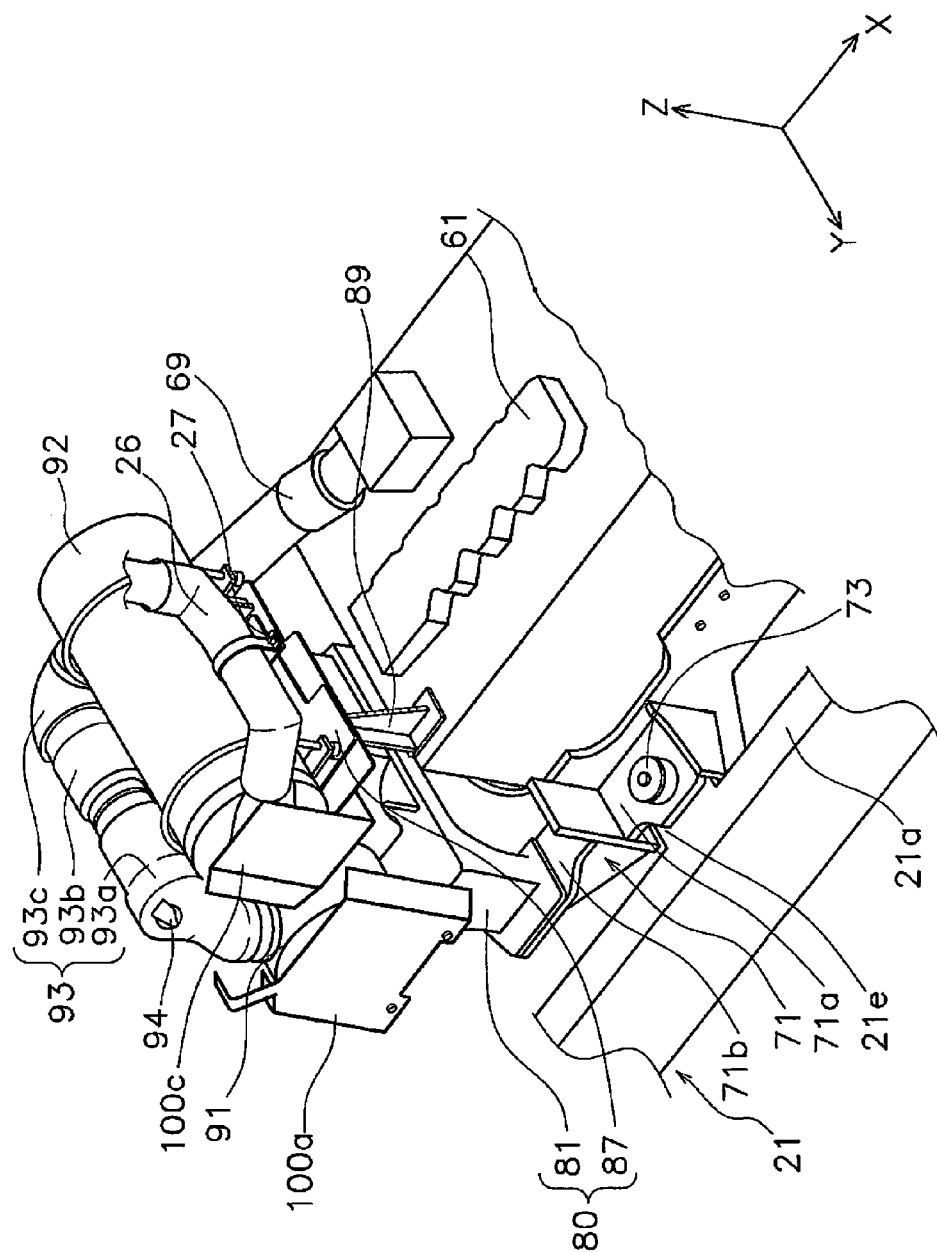


FIG. 7

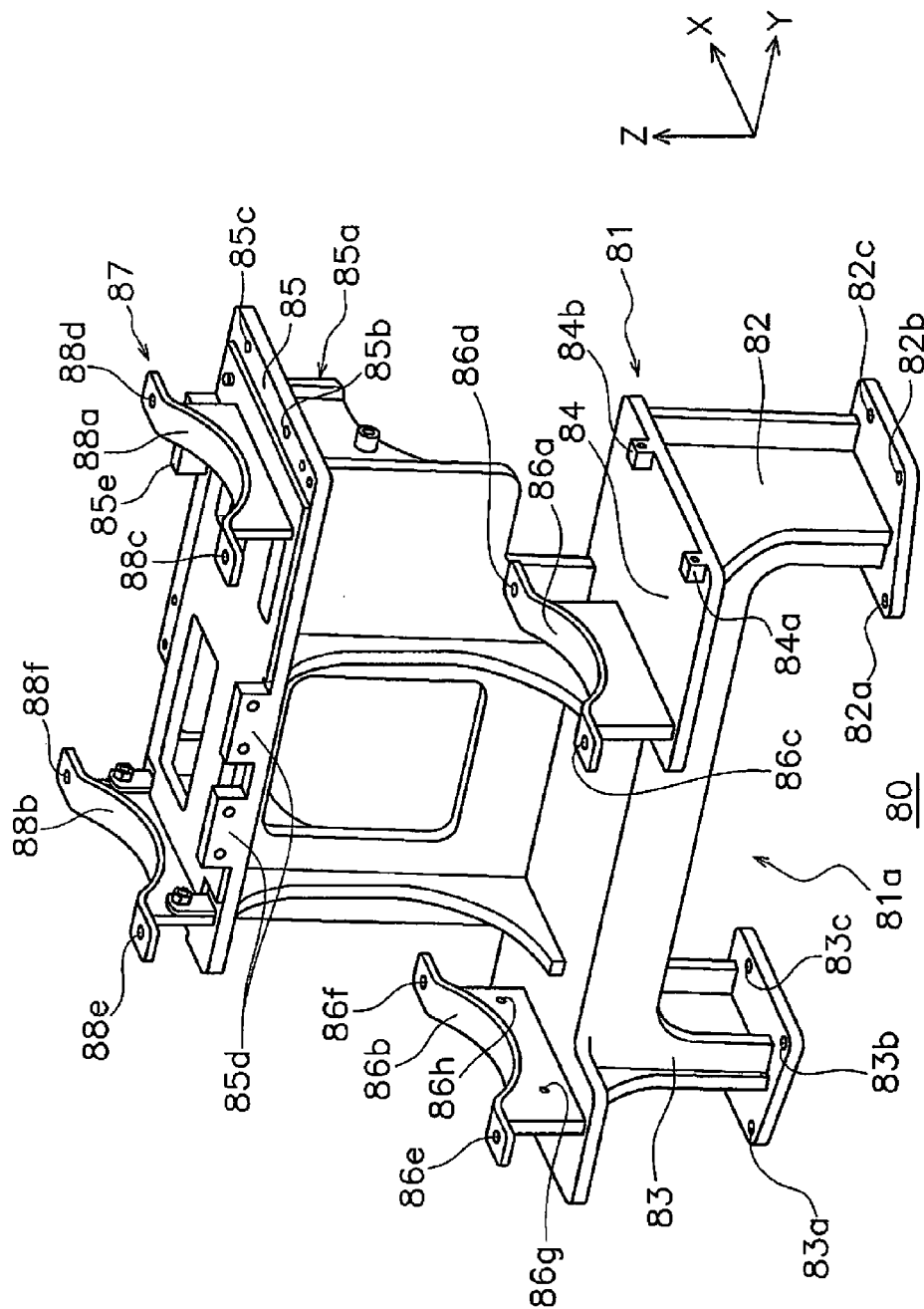


FIG. 8

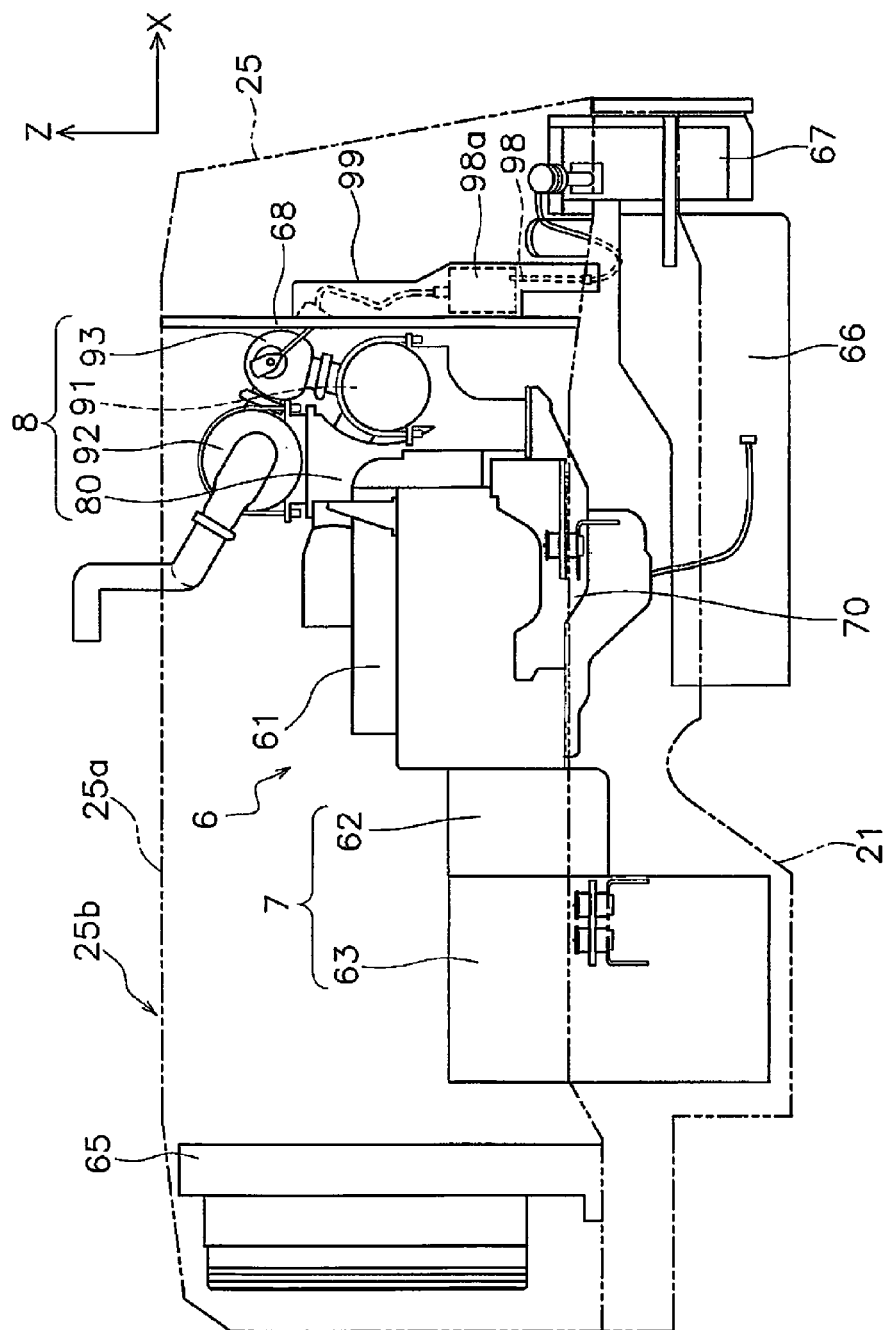


FIG. 9

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WORK VEHICLE

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a U.S. National stage application of International Application No. PCT/JP2012/083766, filed on Dec. 27, 2012. This U.S. National stage application claims priority under 35 U.S.C. §119(a) to Japanese Patent Application No. 2012-278014, filed in Japan on Dec. 20, 2012, the entire contents of which are hereby incorporated herein by reference.

BACKGROUND

The present invention relates to a work vehicle which is provided with a working implement.

A post-treatment apparatus which treats exhaust from an engine is mounted in the work vehicle (refer to Japanese Laid-Open Patent Application Publication No. 2011-529538). The post-treatment apparatus is connected to the engine by a connecting pipe. It is preferable that the post-treatment apparatus include a diesel particulate filter (DPF) apparatus and a selective catalytic reduction (SCR) apparatus (refer to Japanese Laid-Open Patent Application Publication No. 2012-097413). The DPF apparatus reduces particulate matter in the exhaust. The SCR apparatus reduces nitrogen oxide (NOx) in the exhaust.

In Japanese Laid-Open Patent Application Publication No. 2011-529538, the post-treatment apparatus is arranged above the engine or a hydraulic pump. In Japanese Laid-Open Patent Application Publication No. 2012-097413, the post-treatment apparatus is arranged above the hydraulic pump. The post-treatment apparatus is supported on a table which is connected to a vehicle frame.

SUMMARY

The work vehicle may perform excavation work using a ripper (refer to a ripper **51** in FIG. **1** and FIG. **2**) which is provided in a rear section of the vehicle. At that time, the vehicle frame may be twisted. Accordingly, as in Japanese Laid-Open Patent Application Publication No. 2012-097413, in a case where the post-treatment apparatus is supported by a component connected to the vehicle frame, an excessive load is applied to the connecting pipe which links the post-treatment apparatus and the engine.

On the other hand, a method of mounting the post-treatment apparatus on top of the engine as in Japanese Laid-Open Patent Application Publication No. 2011-529538 may be effective in avoiding the above problem. With this method, the position of the post-treatment apparatus is installed at a higher position and an upper surface of an outer cover which covers the engine and the post-treatment apparatus is heightened. As a result, rear visibility becomes poor.

A work vehicle according to an aspect of the present invention comprises an engine, a diesel particulate filter apparatus, a connecting pipe, and a selective catalytic reduction apparatus. The diesel particulate filter apparatus treats exhaust from the engine. The connecting pipe connects the engine and the diesel particulate filter apparatus. The connecting pipe extends obliquely downward toward the diesel particulate filter apparatus from a connecting position with the engine. The selective catalytic reduction apparatus treats exhaust from the engine. The selective catalytic reduction apparatus is arranged above the connecting pipe.

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The engine, the selective catalytic reduction apparatus, and the diesel particulate filter apparatus may be arranged from the front of the vehicle to the rear in order. In more detail, the engine, the selective catalytic reduction apparatus, and the diesel particulate filter apparatus may be arranged such that the center of the engine in the front and back direction, the center of the selective catalytic reduction apparatus in the front and back direction, and the center of the diesel particulate filter apparatus in the front and back direction are positioned from the front of the vehicle to the rear in order.

The diesel particulate filter apparatus and the selective catalytic reduction apparatus may have a cylindrical outline. Then, the diesel particulate filter apparatus and the selective catalytic reduction apparatus may be arranged such that the center axis line of the diesel particulate filter apparatus and the center axis line of the selective catalytic reduction apparatus are orthogonal to the front and back direction of the vehicle.

The selective catalytic reduction apparatus may be arranged above the diesel particulate filter apparatus. In more detail, the diesel particulate filter apparatus and the selective catalytic reduction apparatus may have a cylindrical outline. Then, the diesel particulate filter apparatus and the selective catalytic reduction apparatus may be arranged such that the center axis line of the selective catalytic reduction apparatus is above the center axis line of the diesel particulate filter apparatus.

The work vehicle may further comprise a post-treatment apparatus support bracket. The post-treatment apparatus support bracket supports the diesel particulate filter apparatus and the selective catalytic reduction apparatus.

The work vehicle may further comprise a mounting bracket. The mounting bracket supports the engine. The mounting bracket may include a damper mounting section and a post-treatment apparatus support bracket mounting section. A damper is attached to the damper mounting section. The post-treatment apparatus support bracket is attached to the post-treatment apparatus support bracket mounting section. Then, the post-treatment apparatus support bracket mounting section may be as high as or higher than the damper mounting section in the vertical direction.

The mounting bracket and the post-treatment apparatus support bracket may be integrally formed.

In the work vehicle according to an aspect of the present invention, the connecting pipe extends obliquely downward toward the diesel particulate filter apparatus from the connecting position with the engine, and the selective catalytic reduction apparatus is arranged above the connecting pipe. Accordingly, it is possible to suppress the height of the selective catalytic reduction apparatus in the vertical direction and the upper surface of the outer cover is not heightened due to the selective catalytic reduction apparatus. As a result, the rear visibility is improved.

BRIEF DESCRIPTION OF DRAWINGS

FIG. **1** illustrates a perspective view of an external appearance of a work vehicle.

FIG. **2** illustrates a side view of a work vehicle.

FIG. **3** illustrates a right side view of an internal configuration of an engine compartment.

FIG. **4** illustrates an enlarged view of the vicinity of a post-treatment unit of FIG. **3**.

FIG. **5** illustrates a top view of an internal configuration of an engine compartment.

FIG. **6** illustrates a perspective view of the post-treatment unit which is seen from the A direction of FIG. **3** and FIG. **5**.

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FIG. 7 illustrates a perspective view of the post-treatment unit which is seen from the B direction of FIG. 3 and FIG. 5.

FIG. 8 illustrates a perspective view of a post-treatment apparatus support bracket.

FIG. 9 illustrates a modified example of an embodiment of the present invention.

DETAILED DESCRIPTION OF EMBODIMENT(S)

FIG. 1 and FIG. 2 illustrate a perspective view and a side view of an external appearance of a work vehicle 1 according to an embodiment of the present invention. The work vehicle 1 is, for example, a motor grader. The work vehicle 1 is provided with driving wheels which include front wheels 11 and rear wheels 12. In FIG. 1 and FIG. 2, a case is illustrated where the work vehicle 1 is provided with a pair of two front wheels 11 to the left and right and four rear wheels 12 with two on each side, but the number and arrangement of the driving wheels is not limited to those in the above description. The work vehicle 1 can perform ground leveling work, snow removal work, light cutting, material mixing, and the like using a blade 42 provided between the front wheels 11 and the rear wheels 12. Here, in FIG. 1 and FIG. 2, out of the rear wheels 12, only the rear wheels positioned at the right side are illustrated. Here, in the following description, the front and back direction has the meaning of the front and back direction of the work vehicle 1. In other words, the front and back direction has the meaning of the front and back direction as seen by an operator who is seated in a cab 3. In addition, the left and right direction or the lateral direction has the meaning of the vehicle width direction of the work vehicle 1. In other words, the left and right direction, the vehicle width direction, or the lateral direction are the direction to the left and right as seen by the operator described above. In addition, in the diagrams, the front and back direction is shown as the X axis, the left and right direction is shown as the Y axis, and the vertical direction is shown as the Z axis.

As shown in FIGS. 1 and 2, the work vehicle 1 is provided with a vehicle frame 2, the cab 3, a working implement 4, and a rear working implement 5. In addition, the work vehicle 1 is also provided with components (refer to FIG. 3 and FIG. 5) arranged in an engine compartment 6.

Vehicle Frame 2 and Cab 3

The vehicle frame 2 comprises a rear section frame 21, a front section frame 22, and an outer cover 25 as shown in FIG. 1 and FIG. 2.

The rear section frame 21 supports the outer cover 25, the components arranged in the engine compartment 6 which will be described later, and the like. The outer cover 25 covers the engine compartment 6. In addition, the rear wheels 12 which will be described later are provided in the rear section frame 21. The vehicle moves due to the rotational drive of the rear wheels 12 caused by the driving force from an engine 61 (refer to FIG. 3 and FIG. 5).

The front section frame 22 is attached to the front of the rear section frame 21. The front wheels 11 are attached to the front end section of the front section frame 22.

The cab 3 is located on the rear section frame 21. A handle, a shift lever, an operating lever for the working implement 4, a brake, an accelerator pedal, an inching pedal, and the like (which are not shown in the diagram) are provided in an inner section of the cab 3. Here, the cab 3 may be located on the front section frame 22.

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Working Implement 4

The working implement 4 includes a drawbar 40, a circle 41, the blade 42, a hydraulic motor 49, various types of hydraulic cylinders 44 to 48, and the like.

The front end section of the drawbar 40 is attached to the front end section of the front section frame 22 so as to be able to pivot. Due to the synchronized expansion and contraction of a pair of lift cylinders 44 and 45, the rear end section of the drawbar 40 is raised and lowered. In addition, the drawbar 40 swings up and down centering on an axis along the traveling direction of the vehicle due to the lift cylinders 44 and 45 expanding and contracting differently. Furthermore, the drawbar 40 moves to the left and right due to the expansion and contraction of a drawbar shift cylinder 46.

The circle 41 is attached to the rear end section of the drawbar 40 so as to be able to rotate. The circle 41 is driven by the hydraulic motor 49 (refer to FIG. 1). The circle 41 rotates in the clockwise or counterclockwise direction with regard to the drawbar 40 as seen from above the vehicle.

The blade 42 is supported so as to be able to slide in the left and right direction with regard to the circle 41 and to be able to swing up and down centering on a shaft parallel to the left and right direction. The blade 42 can move in the left and right direction with regard to the circle 41 using a blade shift cylinder 47. In addition, the blade 42 can change orientation in the up and down direction by swinging centering on a shaft parallel to the left and right direction with regard to the circle 41 using a tilt cylinder 48 (refer to FIG. 2) supported by the circle 41. The blade shift cylinder 47 and the tilt cylinder 48 are supported by the circle 41. As described above, the blade 42 can perform raising and lowering with regard to the vehicle, changing the inclination with regard to the traveling direction, changing the inclination with regard to the horizontal direction, rotating, and shifting in the left and right direction via the drawbar 40 and the circle 41.

The hydraulic motor 49 is driven to be able to rotate the circle 41 by hydraulic pressure supplied from a hydraulic pump (which is not shown in the diagram) which will be described later.

The hydraulic cylinders 44 to 48 are cylinders which are driven by hydraulic pressure supplied from the hydraulic pump. A pair of lift cylinders 44 and 45 is provided spaced apart to the left and right to interpose the front section frame 22. The lift cylinders 44 and 45 are substantially arranged along the vertical direction. The lift cylinders 44 and 45 are attached to the front section frame 22 and the drawbar 40. The lift cylinders 44 and 45 expand and contract to move the rear end section of the drawbar 40 up and down. In this way, the lift cylinders 44 and 45 can move the blade 42 in the up and down direction.

The drawbar shift cylinder 46 is arranged to be inclined with regard to the up and down direction. The drawbar shift cylinder 46 is attached to the side end section of the front section frame 22 and the drawbar 40. The drawbar shift cylinder 46 can expand and contract to change the position of the drawbar 40 with regard to the horizontal direction. In this way, the drawbar shift cylinder 46 can change the position of the blade 42.

The blade shift cylinder 47 is arranged along the longitudinal direction of the blade 42. The blade shift cylinder 47 is attached to the circle 41 and the blade 42. The blade shift cylinder 47 can expand and contract to change the position of the blade 42 in the longitudinal direction.

The tilt cylinder 48 is attached to the circle 41 and the blade 42. The tilt cylinder 48 can expand and contract to swing the blade 42 up and down centering on a shaft along the horizon-

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tal direction. In this way, the tilt cylinder 48 can change the angle of inclination of the blade 42 with regard to the traveling direction.

Rear Section Work Machine 5

The rear working implement 5 can be attached to or detached from the work vehicle 1. Accordingly, the work vehicle 1 need not include the rear working implement 5. The rear working implement 5 has the ripper 51, a lifting cylinder 52, and the like. The ripper 51 is used in excavation work. The ripper 51 is attached to the rear section frame 21 so as to be able to be lifted and lowered. The lifting cylinder 52 is a cylinder which is driven by hydraulic pressure supplied from the hydraulic pump. The lifting cylinder 52 can expand and contract to move the rear end section of the ripper 51 up and down. In this way, the lifting cylinder 52 can move the ripper 51 in the vertical direction.

Internal Configuration of Engine Compartment 6

FIG. 3 illustrates a right side view of the internal configuration of an engine compartment. FIG. 4 illustrates an enlarged view of the vicinity of a post-treatment unit 8 (which will be described in detail later) of FIG. 3. FIG. 5 illustrates a top view of the internal configuration of the engine compartment. In FIG. 3, for convenience of description, the outlines of the rear section frame 21 and the outer cover 25 are shown by a two-dot chain line. In FIG. 5, the outlines of the outer cover 25 and a hydraulic oil tank 101 which will be described later are shown by a two-dot chain line and the outline of a reducing agent tank 67 which will be described later is shown by a dotted line. Here, in FIG. 3 to FIG. 5, covers 100a to 100c (refer to FIG. 6 and FIG. 7, described in detail later) are not shown for convenience of description.

As shown in FIG. 3 and FIG. 5, the engine 61, a power transmission apparatus 7, a radiator 65, the post-treatment unit 8, the hydraulic oil tank 101, and the like are arranged in the engine compartment 6. A fuel tank 66 and the reducing agent tank 67 are arranged below the engine compartment 6. In other words, the fuel tank 66 and the reducing agent tank 67 are arranged so as to protrude below the vehicle frame. The engine compartment 6 is covered by the outer cover 25.

As shown in FIG. 3, the rear section frame 21 includes a first support section 21a and a second support section 21b with different heights in the vertical direction, and a tapered section 21c. The first support section 21a is higher than the second support section 21b in the vertical direction. The tapered section 21c is positioned between the first support section 21a and the second support section 21b. Here, the first support section 21a, the second support section 21b, and the tapered section 21c are arranged to be substantially left and right symmetrical at both the left and right sides of the rear section frame 21.

The outer cover 25 is attached to the rear section frame 21. The outer cover 25 covers the engine compartment. That is, the outer cover 25 is arranged above the engine 61, a diesel particulate filter apparatus 91, a selective catalytic reduction apparatus 92, and the radiator 65.

Fuel retained in the fuel tank 66 is supplied to the engine 61. The engine 61 generates driving force by burning the fuel and transmits the driving force to the torque converter 62 and the hydraulic pump. A mounting bracket 70 is attached to the engine 61. The mounting bracket 70 is attached to the rear section frame 21 through dampers 73 and 74 (refer to FIG. 5). In more detail, the mounting bracket 70 is attached to the first support section 21a through the dampers 73 and 74. Accordingly, the mounting bracket 70 supports the engine 61 and connects the engine 61 to the rear section frame 21 (that is, the vehicle frame 2). In other words, the mounting bracket 70 and the engine 61 are elastically supported by the first support

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section 21a. That is, the mounting bracket 70 and the engine 61 are elastically supported by the rear section frame 21. The details of the mounting bracket 70 will be described later.

The power transmission apparatus 7 includes the torque converter 62 and a transmission 63. The torque converter 62 and the transmission 63 are arranged below the hydraulic oil tank 101. Flanges 63a and 63b (refer to FIG. 5) are attached to the transmission 63. The flange 63a is attached to the rear section frame 21 through dampers 79a and 79b. The flange 63b is attached to the rear section frame 21 through dampers 79c and 79d (refer to FIG. 5). In more detail, the flanges 63a and 63b are attached to the first support section 21a through the dampers 79a to 79d. In other words, the torque converter 62 and the transmission 63 are elastically supported by the first support section 21a. That is, the torque converter 62 and the transmission 63 are elastically supported by the rear section frame 21.

The torque converter 62 is connected to the output side of the engine 61. The transmission 63 is connected to the output side of the torque converter 62. The transmission 63 includes a hydraulic-type clutch, transmission gears, and the like (which are not shown in the diagram) inside the transmission 63. The transmission 63 converts the rotational speed and torque of its input shaft which is connected to the output side of the torque converter 62. The converted rotational speed and torque are eventually transmitted from an output shaft of the transmission 63 to the rear wheels 12 via a final reduction gear and tandem apparatus (which are not shown in the diagram). The vehicle moves due to the rotational driving of the rear wheels 12.

A hydraulic pump (which is not shown in the diagram) is provided to accompany the transmission 63. The hydraulic pump drives each type of clutch of the transmission 63, the hydraulic motor 49, and each type of cylinder 44 to 48 using the hydraulic pressure of hydraulic oil retained in the hydraulic oil tank 101.

The radiator 65 cools cooling water in the engine 61. Here, the radiator 65 is provided behind the engine 61 and the post-treatment unit 8 in the vehicle. In other words, the engine 61 and the post-treatment unit 8 are provided in front of the radiator 65 in the vehicle. The radiator 65 is supported by the second support section 21b. That is, the radiator 65 is supported by the rear section frame 21 at a position which is lower than a position which is supported by the mounting bracket 70. That is, the radiator 65 is supported by the rear section frame 21 at a position which is lower than the position where the bracket 9 is supported by the rear section frame 70. Internal Configuration of Post-Processing Unit 8

Next, the details of the post-treatment unit 8 will be described. FIG. 6 illustrates a perspective view of the post-treatment unit 8 which is seen from the A direction of FIG. 3 and FIG. 5. FIG. 7 illustrates a perspective view of the post-treatment unit 8 which is seen from the B direction of FIG. 3 and FIG. 5. In FIG. 6 and FIG. 7, for convenience of description, the illustration of the shape of a portion of the engine 61, a partition wall 68, a protective cover 99 of a supply pipe 98 of the reducing agent, and a portion of the pipe is omitted.

As shown in FIG. 4, FIG. 6, and FIG. 7, the post-treatment unit 8 includes a post-treatment apparatus support bracket 80, the diesel particulate filter apparatus 91, the selective catalytic reduction apparatus 92, and a second connecting pipe 93. In addition, the work vehicle 1 is further provided with a first connecting pipe 69, and an exhaust pipe 26. The first connecting pipe 69 is a pipe for feeding exhaust of the engine 61 to the post-treatment unit 8. The first connecting pipe 69 connects the engine 61 and the diesel particulate filter appa-

ratus 91. The exhaust pipe 26 is a pipe for discharging exhaust, which is processed in the post-treatment unit 8, from the engine 61.

In the present embodiment, the diesel particulate filter apparatus 91 treats the exhaust from the engine 61 which is fed via the first connecting pipe 69. The diesel particulate filter apparatus 91 captures particulate matter included in the exhaust using a filter. The diesel particulate filter apparatus 91 incinerates the captured particulate matter using a heater installed in the filter.

As shown in FIG. 5, the diesel particulate filter apparatus 91 is positioned in front of the radiator 65. As shown in FIG. 3 to FIG. 7, the diesel particulate filter apparatus 91 has a substantially cylindrical outline. As shown in FIG. 5, the diesel particulate filter apparatus 91 is arranged such that a center axis line Ay1 thereof is along the vehicle width direction. That is, the diesel particulate filter apparatus 91 is arranged such that the center axis line Ay1 is orthogonal to the front and back direction.

As shown in FIG. 4 and FIG. 6, the diesel particulate filter apparatus 91 includes a first connection port 91a and a second connection port 91b. The first connecting pipe 69 is connected to the first connection port 91a. The second connecting pipe 93 is connected to the second connection port 91b.

The first connection port 91a protrudes obliquely upward. Specifically, the first connection port 91a protrudes obliquely upward and toward the engine 61 side. In contrast to this, the first connecting pipe 69 extends obliquely downward toward the diesel particulate filter apparatus 91 from a connecting position with the engine 61. As a result, the highest position of the diesel particulate filter apparatus 91 is lower than the highest position of the engine 61. In addition, the diesel particulate filter apparatus 91 is arranged at a position which does not overlap with the engine 61 in top view. That is, at least one of the diesel particulate filter apparatus 91 and the selective catalytic reduction apparatus 92 is arranged at a position which does not overlap with the engine 61 in top view.

The second connection port 91b inclines slightly toward the rear from the vertical direction. As a result, as shown in FIG. 5, a center axis line Ay3 of a linear section 93b (which is described in detail later) of the second connecting pipe 93 is positioned slightly behind the center axis line Ay1 in top view.

The second connecting pipe 93 is a relay connecting pipe which connects the diesel particulate filter apparatus 91 and the selective catalytic reduction apparatus 92. As shown in FIG. 4, the outer diameter of the second connecting pipe 93 is smaller than the outer diameter of the diesel particulate filter apparatus 91. One end of the second connecting pipe 93 is connected to the second connection port 91b of the diesel particulate filter apparatus 91. The other end of the second connecting pipe 93 is connected to a third connection port 92a of the selective catalytic reduction apparatus 92. The second connecting pipe 93 is arranged in the vicinity of the diesel particulate filter apparatus 91 above the diesel particulate filter apparatus 91.

As shown in FIGS. 5 to 7, the second connecting pipe 93 includes a first curved portion 93a, the linear section 93b, and a second curved portion 93c. The linear section 93b is positioned above the diesel particulate filter apparatus 91. As shown in FIG. 5, the linear section 93b is arranged such that the center axis line Ay3 is along the vehicle width direction. That is, the linear section 93b is arranged such that the center axis line Ay3 is parallel to the center axis line Ay1 of the diesel particulate filter apparatus 91. The first curved portion 93a links the linear section 93b and the second connection port 91b. The second curved portion 93c links the linear section

93b and the third connection port 92a of the selective catalytic reduction apparatus 92. A reducing agent ejection apparatus 94 is attached to the first curved portion 93a. The reducing agent ejection apparatus 94 ejects the reducing agent inside the second connecting pipe 93. The reducing agent is, for example, aqueous urea.

In the present embodiment, the selective catalytic reduction apparatus 92 treats the exhaust, which is treated by the diesel particulate filter apparatus 91, from the engine 61. The selective catalytic reduction apparatus 92 selectively reduces nitrogen oxide NOx. The selective catalytic reduction apparatus 92 is arranged above the first connecting pipe 69.

The selective catalytic reduction apparatus 92 has a substantially cylindrical outline. As shown in FIG. 5, the selective catalytic reduction apparatus 92 is arranged such that a center axis line Ay2 is along the vehicle width direction. That is, the selective catalytic reduction apparatus 92 is arranged such that the center axis line Ay2 is orthogonal to the front and back direction. In addition, the selective catalytic reduction apparatus 92 is arranged such that the center axis line Ay2 is parallel to the center axis line Ay1 of the diesel particulate filter apparatus 91. In addition, as shown in FIG. 3 and FIG. 5, the engine 61, the selective catalytic reduction apparatus 92 and the diesel particulate filter apparatus 91 are arranged such that a center E of the engine 61 in the front and back direction, a center Ay2 of the selective catalytic reduction apparatus 92 in the front and back direction, and a center Ay1 of the diesel particulate filter apparatus 91 in the front and back direction are positioned from the front of the vehicle to the rear in order. That is, the engine 61, the selective catalytic reduction apparatus 92 and the diesel particulate filter apparatus 91 are arranged from the front of the vehicle to the rear in order.

As shown in FIG. 5, the selective catalytic reduction apparatus 92 is positioned in front of the radiator 65. In more detail, the selective catalytic reduction apparatus 92 is arranged to be laterally adjacent to the second connecting pipe 93. In addition, as described above, the diameter of the second connecting pipe 93 is smaller than the diameter of the diesel particulate filter apparatus 91, and the center axis line Ay3 of the linear section 93b of the second connecting pipe 93 is positioned slightly behind the center axis line Ay1 in top view. As a result, the selective catalytic reduction apparatus 92 is arranged to overlap with a portion of the diesel particulate filter apparatus 91 in top view. In addition, the selective catalytic reduction apparatus 92 is arranged so as to overlap with a portion of the engine 61 in top view.

As shown in FIG. 3 and FIG. 4, the diesel particulate filter apparatus 91 and the selective catalytic reduction apparatus 92 are arranged such that the center axis line Ay2 of the selective catalytic reduction apparatus 92 is above the center axis line Ay1 of the diesel particulate filter apparatus 91. In other words, the selective catalytic reduction apparatus 92 is arranged above the diesel particulate filter apparatus 91.

The selective catalytic reduction apparatus 92 is arranged such that the highest position thereof is as high as or lower than the highest position of the radiator 65. FIG. 3 illustrates an example where the highest position of the selective catalytic reduction apparatus 92 is as high as the highest position of the radiator 65. However, the highest position of the selective catalytic reduction apparatus 92 may be lower than the highest position of the radiator 65. In addition, the highest position of the diesel particulate filter apparatus 91 is lower than the highest position of the selective catalytic reduction apparatus 92. Accordingly, both the highest position of the diesel particulate filter apparatus 91 and the highest position of the selective catalytic reduction apparatus 92 are as high as or lower than the highest position of the radiator 65. Accord-

ingly, as shown in FIG. 3, an upper surface 25a of the outer cover 25 can be set horizontally. Therefore, it is possible to realize excellent rear visibility.

As shown in FIG. 3 to FIG. 7, the selective catalytic reduction apparatus 92 includes the third connection port 92a and a fourth connection port 92b. The second connecting pipe 93 is connected to the third connection port 92a. The exhaust pipe 26 is connected to the fourth connection port 92b. That is, the exhaust pipe 26 is connected to the selective catalytic reduction apparatus 92.

The third connection port 92a is inclined slightly downward from the horizontal direction toward the rear. Accordingly, as shown in FIG. 3, the center axis line Ay3 of the linear section 93b of the second connecting pipe 93 is positioned slightly below the center axis line Ay2 in the vertical direction.

The fourth connection port 92b protrudes obliquely upward. Specifically, the fourth connection port 92b protrudes upward and obliquely toward the engine 61 side. Due to this, the exhaust pipe 26 protrudes obliquely upward above the engine 61. As a result, the outer cover 25 can be lowered, as compared to a case in which the fourth connection port 92b protrudes exactly upward. Furthermore, it is possible to arrange an air cleaner which is not shown in the diagram between the exhaust pipe 26 and the engine 61. The upper section of the exhaust pipe 26 protrudes upward from the outer cover 25.

The engine 61, the first connecting pipe 69, the diesel particulate filter apparatus 91, the second connecting pipe 93, the selective catalytic reduction apparatus 92, and the exhaust pipe 26 are connected in series in this order. Accordingly, the exhaust from the engine 61 passes through the first connecting pipe 69 and is fed to the diesel particulate filter apparatus 91. In the diesel particulate filter apparatus 91, the particulate matter is mostly reduced from the exhaust. Next, the exhaust passes through the second connecting pipe 93 and is fed to the selective catalytic reduction apparatus 92. In the selective catalytic reduction apparatus 92, the NOx is mostly reduced. Thereafter, the exhaust gas which has been cleaned passes through the exhaust pipe 26 and is discharged to the outside. Support Member of Post-Treatment Unit 8

Next, the manner in which each of the components of the post-treatment unit 8 is supported will be described. As shown in FIG. 6, the mounting bracket 70 has a first mounting component 71 and a second mounting component 72.

As shown in FIG. 7, the first mounting component 71 is attached to the right side surface of the engine 61 by a bolt or the like. The first mounting component 71 includes a first damper mounting section 71a and a first post-treatment apparatus support bracket mounting section 71b. That is, the mounting bracket 70 includes the first damper mounting section 71a and the first post-treatment apparatus support bracket mounting section 71b. The first support section 21a includes a first protruding section 21e which protrudes inside the vehicle, and the first damper mounting section 71a overlaps with the first protruding section 21e. A damper 73 is attached to the first damper mounting section 71a and the damper 73 is mounted on the first protruding section 21e. The first post-treatment apparatus support bracket mounting section 71b is provided at one end (the rear end) of the first mounting component 71. That is, the first post-treatment apparatus support bracket mounting section 71b is provided at one end (the rear end) of the mounting bracket 70. The post-treatment unit 8 is attached to the first post-treatment apparatus support bracket mounting section 71b. In more detail, the post-treatment apparatus support bracket 80 is fixed to the first post-treatment apparatus support bracket

mounting section 71b by a bolt or the like. The first damper mounting section 71a is provided between one end (the rear end) and the other end (the front end) of the first mounting component 71 which is provided with the first post-treatment apparatus support bracket mounting section 71b. That is, the first damper mounting section 71a is provided between one end (the rear end) and the other end (the front end) of the mounting bracket 70 which is provided with the first post-treatment apparatus support bracket mounting section 71b. The first support section 21a includes the first protruding section 21e which protrudes inside the vehicle, and the first damper mounting section 71a overlaps with the first protruding section 21e. A damper 73 is attached to the first damper mounting section 71a, and the damper 73 is mounted on the first protruding section 21e. As shown in FIG. 4 and FIG. 7, the first post-treatment apparatus support bracket mounting section 71b is as high as or higher than the first damper mounting section 71a in the vertical direction.

As shown in FIG. 6, the second mounting component 72 is attached to the left side surface of the engine 61 by a bolt or the like. The second mounting component 72 includes a second damper mounting section 72a and a second post-treatment apparatus support bracket mounting section 72b. That is, the mounting bracket 70 includes the second damper mounting section 72a and the second post-treatment apparatus support bracket mounting section 72b. The first support section 21a includes a second protruding section 21f which protrudes inside the vehicle, and the second damper mounting section 72a overlaps with the second protruding section 21f. The damper 74 is attached to the second damper mounting section 72a and the damper 74 is mounted on the second protruding section 21f. The second post-treatment apparatus support bracket mounting section 72b is provided at one end (the rear end) of the second mounting component 72. That is, the second post-treatment apparatus support bracket mounting section 72b is provided at one end (the rear end) of the mounting bracket 70. The post-treatment unit 8 is attached to the second post-treatment apparatus support bracket mounting section 72b. In more detail, the post-treatment apparatus support bracket 80 is fixed to the second post-treatment apparatus support bracket mounting section 72b by a bolt or the like. The second damper mounting section 72a is provided between one end (the rear end) and the other end (the front end) of the second mounting component 72 which is provided with the second post-treatment apparatus support bracket mounting section 72b. That is, the second damper mounting section 72a is provided between one end (the rear end) and the other end (the front end) of the mounting bracket 70 which is provided with the second post-treatment apparatus support bracket mounting section 72b. The first support section 21a includes the second protruding section 21f which protrudes inside the vehicle, and the second damper mounting section 72a overlaps with the second protruding section 21f. The damper 74 is attached to the second damper mounting section 72a, and the damper 74 is mounted on the second protruding section 21f. As shown in FIG. 6, the second post-treatment apparatus support bracket mounting section 72b is as high as or higher than the second damper mounting section 72a in the vertical direction.

Due to such a configuration, the post-treatment unit 8 can be attached to and detached from the mounting bracket 70 in the first post-treatment apparatus support bracket mounting section 71b and the second post-treatment apparatus support bracket mounting section 72b at one end (the rear end) of the mounting bracket 70. In other words, the post-treatment unit 8 is supported by the mounting bracket 70 at one end (the rear end) of the mounting bracket 70. In more detail, the post-

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treatment apparatus support bracket **80** is supported by the mounting bracket **70** at one end (the rear end) of the mounting bracket **70**. In addition, the post-treatment unit **8** is elastically supported by the first support section **21a**. That is, the post-treatment unit **8** is elastically supported by the rear section frame **21**. Accordingly, the post-treatment unit **8** vibrates integrally with the engine **61**.

In addition, as described above, the torque converter **62** and the transmission **63**, the torque converter **62** and the engine **61**, the engine **61** and the mounting bracket **70**, the mounting bracket **70** and the post-treatment unit **8** are connected to each other, and the components of them are all connected to the rear section frame **21** via the dampers **79a** to **79d**, **73**, and **74**. Accordingly, the torque converter **62**, transmission **63**, the engine **61**, and the post-treatment unit **8** vibrate integrally and are not easily affected by the vibration from the rear section frame **21**.

FIG. **8** illustrates a perspective view of a post-treatment apparatus support bracket **80**. The post-treatment apparatus support bracket **80** includes a lower member **81**, an upper member **87**, and an anti-sway component **89** (refer to FIG. **7**). FIG. **8** illustrates only the lower member **81** and the upper member **87**. The upper member **87** is detachably mounted on the lower member **81**. The lower member **81** includes a right leg section **82**, a left leg section **83**, a lower step section **84**, an upper step section **85**, and lower support sections **86a** and **86b**. The upper member **87** includes upper support sections **88a** and **88b**. As shown in FIG. **5**, the post-treatment apparatus support bracket **80** is positioned in front of the radiator **65**.

The right leg section **82** includes first connecting sections **82a**, **82b**, and **82c** for fixing to the first post-treatment apparatus support bracket mounting section **71b**. In the same manner, the left leg section **83** includes second connecting sections **83a**, **83b**, and **83c** for fixing to the second post-treatment apparatus support bracket mounting section **72b**.

An opening section **81a** is formed between the right leg section **82** and the left leg section **83** and below the lower step section **84**. That is, the post-treatment apparatus support bracket **80** includes the opening section **81a**. In the opening section **81a**, it is possible to provide another power unit which is not shown in the diagram via a PTO (power take off) pump (which is not shown in the diagram) which is connected to a connecting pipe **61a** (refer to FIG. **6**) with the engine **61**.

The upper step section **85** and the lower step section **84** have different heights from a connecting position with the mounting bracket **70** (the position of the first connecting sections **82a** to **82c** and the second connecting sections **83a** to **83c**). In more detail, the upper step section **85** is higher than the lower step section **84**. The lower member **81** has a stepped shape which includes the upper step section **85** and the lower step section **84**. In addition, as shown in FIG. **4** and the like, the lower member **81** is arranged such that the upper step section **85** is positioned at a closer position to the engine **61** than the lower step section **84** in top view.

Furthermore, the upper step section **85** includes a third connecting section **85a** on the side surface of the engine **61** side. As shown in FIG. **4** and FIG. **7**, the anti-sway component **89** is attached to the third connecting section **85a**. The anti-sway component **89** is connected to the engine **61** and links the upper portion of the engine **61** and the upper step section **85**. Since the post-treatment unit **8** has a heavy object at the upper section thereof, the upper portion of the post-treatment unit **8** can easily vibrate considerably, in particular in the front and back direction, due to the vibration of the mounting bracket **70**. The anti-sway component **89** is fixed to the upper section of the engine **61**, so that the anti-sway component **89**

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reduces vibration of the upper portion of the post-treatment unit **8** in the front and back direction.

Lower support sections **86a** and **86b** are provided over the lower step section **84**. The lower support sections **86a** and **86b** support the diesel particulate filter apparatus **91**. That is, the post-treatment apparatus support bracket **80** supports the diesel particulate filter apparatus **91**. The diesel particulate filter apparatus **91** has a substantially cylindrical outline, and the lower support section **86a** and **86b** have contact surfaces which correspond to the peripheral surface of the diesel particulate filter apparatus **91**. In more detail, the lower support sections **86a** and **86b** have contact surfaces with a convex shape which expands in a downward direction.

The lower support sections **86a** and **86b** include fourth connecting sections **86c**, **86d**, **86e**, and **86f**. The fourth connecting sections **86c** to **86f** include holes which first fastening components **95a** and **95b** (refer to FIG. **6**) which are fastened to the diesel particulate filter apparatus **91** pass through. As shown in FIG. **4** and FIG. **6**, in the fourth connecting sections **86c** to **86f**, the first fastening components **95a** and **95b** are fastened with a nut to the back of the lower support sections **86a** and **86b** which is opposite to the side where the diesel particulate filter apparatus **91** is supported. In this manner, the diesel particulate filter apparatus **91** is fastened onto the lower support sections **86a** and **86b** by the first fastening components **95a** and **95b**.

When the upper member **87** is attached to the lower member **81**, the upper support sections **88a** and **88b** are positioned over the upper step section **85**. Accordingly, the upper support sections **88a** and **88b** and the lower support sections **86a** and **86b** have different heights from the connecting position with the mounting bracket **70** (the position of the first connecting sections **82a** to **82c** and the second connecting sections **83a** to **83c**). In more detail, the upper support sections **88a** and **88b** are higher than the lower support sections **86a** and **86b**. Furthermore, as shown in FIG. **4** and the like, the upper support sections **88a** and **88b** are positioned at a closer position to the engine **61** than the lower support sections **86a** and **86b** in top view.

The upper support section **88a** and **88b** support the selective catalytic reduction apparatus **92**. That is, the post-treatment apparatus support bracket **80** supports the selective catalytic reduction apparatus **92**. The selective catalytic reduction apparatus **92** has a substantially cylindrical outline, and the upper support sections **88a** and **88b** have contact surfaces which correspond to the peripheral surface of the selective catalytic reduction apparatus **92**. In more detail, the upper support sections **88a** and **88b** have contact surfaces with a convex shape which expand in a downward direction.

The upper support sections **88a** and **88b** include fifth connecting sections **88c**, **88d**, **88e**, and **88f**. The fifth connecting sections **88c** to **88f** include holes which second fastening components **96a** and **96b** (refer to FIG. **6**) which are fastened to the selective catalytic reduction apparatus **92** pass through. As shown in FIG. **4** or FIG. **6**, in the fifth connecting sections **88c** to **88f**, the second fastening components **96a** and **96b** are fastened with a nut to the back of the upper support sections **88a** and **88b** which is opposite to the side where the selective catalytic reduction apparatus **92** is supported. In this manner, the selective catalytic reduction apparatus **92** is fastened onto the upper support sections **88a** and **88b** by the second fastening components **96a** and **96b**.

Here, the lower step section **84** may further have first cover connecting sections **84a** and **84b**. A first cover **100a** (refer to FIG. **7**) which covers the right side surface of the diesel particulate filter apparatus **91** is attached to the first cover connecting sections **84a** and **84b**.

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The lower support section **86b** may further have second cover connecting sections **86g** and **86h**. A second cover **100b** (refer to FIG. 6) which covers the left side surface of the diesel particulate filter apparatus **91** is attached to the second cover connecting sections **86g** and **86h**.

The upper step section **85** may further have third cover connecting sections **85b** and **85c**. A third cover **100c** (refer to FIG. 7) which covers the right side surface of the selective catalytic reduction apparatus **92** is attached to the third cover connecting sections **85b** and **85c**.

In addition, the upper step section **85** may further have a sixth connecting section **85d** and a seventh connecting section **85e**. A third fastening component **97** (refer to FIG. 6) which is fastened to the second connecting pipe **93** is attached to the sixth connecting section **85d**. A fourth fastening component **27** (refer to FIG. 6 and FIG. 7) which is fastened to the exhaust pipe **26** is attached to the seventh connecting section **85e**.

Pipe of Reducing Agent

The reducing agent which is ejected by the reducing agent ejection apparatus **94** is retained in the reducing agent tank **67**. As described above, the reducing agent is, for example, aqueous urea. As shown in FIG. 3 and FIG. 5, the reducing agent tank **67** is arranged behind the radiator **65**, but it is not necessarily limited thereto. The reducing agent tank **67** may be arranged in any place which the heat from the engine **61** and the post-treatment apparatuses **91** and **92** is not easily transmitted to. As shown in FIG. 5, a top plate **21d** is provided over the reducing agent tank **67**. Due to this, hot air from the radiator **65** does not directly hit the reducing agent tank **67** to restrain the reducing agent from being heated.

As shown in FIG. 3 and FIG. 4, the reducing agent is fed from the reducing agent tank **67** to the reducing agent ejection apparatus **94** through the supply pipe **98** and a drawing pump **98a**. In order to restrain the heat from the engine **61** and the post-treatment apparatuses **91** and **92** from being conducted to the supply pipe **98**, the work vehicle **1** is provided with the partition wall **68** in the engine compartment **6**. The partition wall **68** is arranged between the supply pipe **98** and the post-treatment unit **8**. The partition wall **68** is supported by the radiator **65** via a support member which is not shown in the diagram.

In addition, the outer cover **25** includes an air inlet port **25b** (refer to FIG. 1 and FIG. 3) for drawing in outside air between the radiator **65** and the partition wall **68** in top view. The work vehicle **1** is provided with the protective cover **99** which covers the supply pipe **98** and the drawing pump **98a** in the engine compartment **6** in order that the supply pipe **98** is not greatly cooled by the outside air which is drawn in and the cold air from the radiator **65**.

Advantageous Effects

The work vehicle **1** according to the present embodiment is provided with the following features.

In the work vehicle **1**, the first connecting pipe **69** extends obliquely downward from the connecting position with the engine **61** toward the diesel particulate filter apparatus **91**, and the selective catalytic reduction apparatus **92** is arranged above the first connecting pipe **69**. Accordingly, it is possible to suppress the height of the selective catalytic reduction apparatus **92** in the vertical direction. Accordingly, the upper surface of the outer cover **25** is not heightened due to the selective catalytic reduction apparatus **92**. As a result, the rear visibility is improved.

The engine **61**, the selective catalytic reduction apparatus **92** and the diesel particulate filter apparatus **91** are arranged such that the center E of the engine **61** in the front and back

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direction, the center Ay2 of the selective catalytic reduction apparatus **92** in the front and back direction, and the center Ay1 of the diesel particulate filter apparatus **91** in the front and back direction are positioned from the front of the vehicle to the rear in order. That is, the engine **61**, the selective catalytic reduction apparatus **92** and the diesel particulate filter apparatus **91** are arranged from the front of the vehicle to the rear in order. Accordingly, it is possible to further shorten the length of the rear section frame **21** (that is, the vehicle frame **2**) in the front and back direction by arranging the engine **61** below the selective catalytic reduction apparatus **92**. Consequently, it is possible to prevent the work vehicle **1** from being enlarged.

The diesel particulate filter apparatus **91** and the selective catalytic reduction apparatus **92** are arranged such that the central axis Ay1 of the diesel particulate filter apparatus **91** and the central axis Ay2 of the selective catalytic reduction apparatus **92** are orthogonal with regard to the front and back direction of the vehicle. As a result, it is possible to further shorten the front to back length of the post-treatment unit **8**.

The diesel particulate filter apparatus **91** and the selective catalytic reduction apparatus **92** are arranged such that the center axis line Ay2 of the selective catalytic reduction apparatus **92** is above the center axis line Ay1 of the diesel particulate filter apparatus **91**. In other words, the selective catalytic reduction apparatus **92** is arranged above the diesel particulate filter apparatus **91**. As a result, it is possible to arrange the exhaust pipe **26** which is connected to the selective catalytic reduction apparatus **92** so as not to interfere with the first connecting pipe **69** and the second connecting pipe **93** without a special design for the arrangement of the first connecting pipe **69** and the second connecting pipe **93** or the connecting position of the diesel particulate filter apparatus **91** and the selective catalytic reduction apparatus **92**. Due to this, it is possible to shorten the length of the post-treatment unit **8** in the left and right direction. Consequently, it is possible to prevent the work vehicle **1** from being enlarged.

The post-treatment apparatus support bracket **80** supports the diesel particulate filter apparatus **91** and the selective catalytic reduction apparatus **92**. Due to this, compared to a case where the engine **61** directly supports these apparatuses, it is possible to lower the highest position of the post-treatment apparatuses (the higher position among the highest position of the diesel particulate filter apparatus **91** and the highest position of the selective catalytic reduction apparatus **92**). Accordingly, it is possible to lower the upper surface of the outer cover **25**. As a result, the rear visibility is further improved.

The mounting bracket **70** includes the damper mounting sections **71a** and **72a** and the post-treatment apparatus support bracket mounting sections **71b** and **72b**, and the post-treatment apparatus support bracket mounting sections **71b** and **72b** is as high as or higher than the damper mounting sections **71a** and **72a** in the vertical direction. Accordingly, the diesel particulate filter apparatus **91** is arranged above the upper end of the rear section frame **21** (that is, the vehicle frame **2**). When the diesel particulate filter apparatus **91** is arranged below the upper end of the rear section frame **21**, the opening section **81a** of the post-treatment apparatus support bracket **80** for connecting another power unit via the PTO pump is obstructed. As a result, the lower limit of the height of the post-treatment apparatus support bracket **80** is determined such that the diesel particulate filter apparatus **91** is arranged above the upper end of the rear section frame **21** (that is, the vehicle frame **2**).

In the work vehicle **1**, the mounting bracket **70** supports both of the engine **61** and the post-treatment apparatus sup-

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port bracket 80. Accordingly, the engine 61, the diesel particulate filter apparatus 91 and the selective catalytic reduction apparatus 92 all vibrate. As a result, a large load is not applied to the first connecting pipe 69 which links the diesel particulate filter apparatus 91 and the engine 61. As a result, it is not necessary to provide the first connecting pipe 69 with a member which absorbs vibration such as a bellows. Furthermore, it is possible to shorten the first connecting pipe 69.

Both the highest position of the diesel particulate filter apparatus 91 and the highest position of the selective catalytic reduction apparatus 92 are as high as or lower than the highest position of the radiator 65. Accordingly, the upper surface of the outer cover 25 is not heightened due to the post-treatment apparatuses 91 and 92. More specifically, it is possible to set the upper surface of the outer cover 25 horizontal. As a result, the rear visibility is further improved.

At least one of the diesel particulate filter apparatus 91 and the selective catalytic reduction apparatus 92 is arranged at a position which does not overlap with the engine 61 in top view. In more detail, the diesel particulate filter apparatus 91 is arranged at a position which does not overlap with the engine 61 in top view. As a result, compared to a case where both of the diesel particulate filter apparatus 91 and the selective catalytic reduction apparatus 92 are arranged above the engine 61, it is possible to lower the highest position of the post-treatment apparatuses (the higher position among the highest position of the diesel particulate filter apparatus 91 and the highest position of the selective catalytic reduction apparatus 92). Accordingly, it is possible to lower the upper surface of the outer cover 25. As a result, the rear visibility is further improved.

The mounting bracket 70 includes the damper mounting sections 71a and 72a between the one end where the post-treatment apparatus support bracket 80 is supported and the other end. Then, the dampers 73 and 74 are attached between the mounting bracket 70 and the rear section frame 21. As a result, the load of the post-treatment unit 8, which is a heavy object, is distributed to the front and back centered on the dampers 73 and 74. Furthermore, a large load is not applied to the first connecting pipe 69 which links the diesel particulate filter apparatus 91 and the engine 61 even if a twist is generated in the rear section frame 21 due to the ripper work or the like. As a result, it is not necessary to provide the first connecting pipe 69 with a member which absorbs vibration such as a bellows. Furthermore, it is possible to shorten the first connecting pipe 69.

The post-treatment apparatus support bracket 80 has the upper support section 88a and 88b and the lower support sections 86a and 86b whose heights are different from the connecting positions 82a to 82c and 83a to 83c to the mounting bracket 70. Then, the diesel particulate filter apparatus 91 is supported by the lower support sections 86a and 86b and the selective catalytic reduction apparatus 92 is supported by the upper support sections 88a and 88b. Accordingly, since the diesel particulate filter apparatus 91 and the selective catalytic reduction apparatus 92 are arranged at different heights, it is possible to shorten the length of the post-treatment unit 8 in the front and back direction. As a result, it is possible to shorten the length of the rear section frame 21 (that is, the vehicle frame 2) in the front and back direction.

The selective catalytic reduction apparatus 92 is arranged to overlap with a portion of the diesel particulate filter apparatus 91 in planar view. In addition, the selective catalytic reduction apparatus 92 is arranged to be adjacent to the side of the second connecting pipe 93. Accordingly, it is possible to shorten the front to back length of the lower member 81 (that is, the post-treatment apparatus support bracket 80). That is, it

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is possible to further shorten the front to back length of the post-treatment unit 8. As a result, it is possible to further shorten the front to back length of the rear section frame 21 (that is, the vehicle frame 2).

The exhaust pipe 26 protrudes obliquely upward above the engine 61. Due to this, since it is possible to provide a space between the engine 61 and the exhaust pipe 26, it is possible to arrange an air cleaner in the space. In addition, it is possible to lower the outer cover 25 compared to a case where the exhaust pipe 26 protrudes vertically upward.

The rear section frame 21 (that is, the vehicle frame 2) includes the first support section 21a which supports the mounting bracket 70 and the second support section 21b which supports the radiator 65. Then, the second support section 21b is lower than the first support section 21a. Since the second support section 21b is lower than the first support section 21a, it is possible to lower the upper surface of the outer cover 25 even when the radiator 65, which is large with a high cooling capacity, is mounted in order to mount the post-treatment unit 8 on the work vehicle 1. As a result, the rear visibility is further improved.

The post-treatment apparatus support bracket 80 further includes the anti-sway component 89 which is connected to the engine 61. By the anti-sway component 89, the upper portion of the post-treatment apparatus support bracket 80 is fixed to the engine 61. As such, the vibration of the post-treatment apparatus support bracket 80 in the front and back direction of the vehicle is reduced.

The post-treatment apparatus support bracket 80 includes the opening section 81a. Accordingly, it is possible to provide another power unit via the PTO (power take off) pump in the opening section 81a.

Modified Examples

Above, an embodiment of the present invention has been described but the present invention is not limited to the embodiments described above and various modifications are possible in a scope which does not depart from the gist of the invention.

In the embodiment described above, an example where the transmission 63, the torque converter 62, the engine 61, the post-treatment unit 8, the radiator 65, and the reducing agent tank 67 are arranged in the engine compartment 6 from the front of the vehicle to the rear in order has been described. However, this order is arbitrary except for arrangement of the engine 61 and of the post-treatment unit 8 in front of the radiator 65.

FIG. 9 is a diagram illustrating a modified example of the embodiment of the present invention. In the modified example, the reducing agent tank 67, the post-treatment unit 8, the engine 61, the torque converter 62, and the transmission 63 are arranged from the front of the vehicle in order. A work vehicle according to the modified example causes the same effects as in the embodiment of the present invention.

The upper surface of the outer cover 25 need not be set horizontally. For example, in a case where the highest position of the selective catalytic reduction apparatus 92 is lower than the highest position of the radiator 65, the portion at the top of the radiator 65 in the upper surface of the outer cover 25 may be higher than the portion at the top of the selective catalytic reduction apparatus 92.

The selective catalytic reduction apparatus 92 need not overlap with the engine 61 in top view.

The first mounting component 71 and the second mounting component 72 may be formed integrally rather than as separate parts. Similarly, the lower member 81 and the upper

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member **87** may be formed integrally rather than as separate parts. Furthermore, the mounting bracket **70** and the post-treatment apparatus support bracket **80** may be formed integrally. In a case where the mounting bracket **70** and the post-treatment apparatus support bracket **80** are formed integrally, the post-treatment apparatus support bracket **80** is fixed to the post-treatment apparatus support bracket mounting sections **71b** and **72b**. When the bracket is formed in this manner, it causes the effect of reducing the number of components and of reducing the number of assembly steps.

The number of the dampers **73**, **74**, and **79a** to **79d** is arbitrary. However, it is desirable that the same number of dampers be provided in the left and right directions.

The post-treatment apparatus support bracket **80** need not include either or both of the upper stage section **85** and the lower stage section **84**. However, in such a case, the post-treatment apparatus support bracket **80** includes the lower support section **86a** and **86b** and the upper support sections **88a** and **88b** with different heights. In addition, the work vehicle **1** need not be provided with the post-treatment apparatus support bracket **80**. In this case, the diesel particulate filter apparatus **91** and the selective catalytic reduction apparatus **92** may be directly attached to the engine **61**.

The number of the lower support section **86a** and **86b**, the upper support sections **88a** and **88b**, the first fastening components **95a** and **95b**, and the second fastening components **96a** and **96b** are not limited to two each, but may be one or three or more.

The number and positions of the first connecting section to the seventh connecting section may be appropriately changed. In addition, the post-treatment apparatus support bracket **80** need not include some or all of the first connecting section to the seventh connecting section. The work vehicle **1** need not have some or all of the first cover **100a**, the second cover **100b**, and the third cover **100c**.

The shapes of the diesel particulate filter apparatus **91** and the selective catalytic reduction apparatus **92** are not limited to a cylindrical shape or the like, and may be another shape such as an elliptical shape or a rectangular shape.

The diesel particulate filter apparatus **91** and the selective catalytic reduction apparatus **92** may be arranged to be lined up in different directions the vehicle width direction. That is, the diesel particulate filter apparatus **91** and the selective catalytic reduction apparatus **92** may be arranged to be lined up in the vehicle front and back direction.

INDUSTRIAL APPLICABILITY

According to the present invention, it is possible to provide a work vehicle which maintains excellent rear visibility with a function of exhaust treatment.

The invention claimed is:

1. A work vehicle comprising:

- an engine;
- a diesel particulate filter apparatus configured to treat exhaust from the engine;
- a connecting pipe connecting the engine and the diesel particulate filter apparatus, the connecting pipe extending obliquely downward toward the diesel particulate filter apparatus from a connecting position with the engine;
- a selective catalytic reduction apparatus configured to treat exhaust from the engine, the selective catalytic reduction apparatus being arranged above the connecting pipe;
- a mounting bracket supporting the engine;

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a vehicle frame elastically supporting the mounting bracket; and

a post-treatment apparatus support bracket supporting the diesel particulate filter apparatus and the selective catalytic reduction apparatus, the post-treatment apparatus support bracket being supported by the mounting bracket.

2. The work vehicle according to claim 1, wherein the engine, the selective catalytic reduction apparatus, and the diesel particulate filter apparatus are arranged such that

a center of the engine in a front and back direction, a center of the selective catalytic reduction apparatus in the front and back direction, and

a center of the diesel particulate filter apparatus in the front and back direction

are positioned from a front of the vehicle to a rear of the vehicle in order.

3. The work vehicle according to claim 2, wherein

each of the diesel particulate filter apparatus and the selective catalytic reduction apparatus have a cylindrical outline, and

the diesel particulate filter apparatus and the selective catalytic reduction apparatus are arranged such that

a center axis line of the cylindrical outline of the diesel particulate filter apparatus and

a center axis line of the cylindrical outline of the selective catalytic reduction apparatus

are orthogonal to the front and back direction of the vehicle.

4. The work vehicle according to claim 2, wherein

each of the diesel particulate filter apparatus and the selective catalytic reduction apparatus have a cylindrical outline, and

the diesel particulate filter apparatus and the selective catalytic reduction apparatus are arranged such that a center axis line of the cylindrical outline of the selective catalytic reduction apparatus is higher than a center axis line of the cylindrical outline of the diesel particulate filter apparatus.

5. The work vehicle according to claim 1, wherein

each of the diesel particulate filter apparatus and the selective catalytic reduction apparatus have a cylindrical outline, and

the diesel particulate filter apparatus and the selective catalytic reduction apparatus are arranged such that

a center axis line of the cylindrical outline of the diesel particulate filter apparatus and

a center axis line of the cylindrical outline of the selective catalytic reduction apparatus

are orthogonal to the front and back direction of the vehicle.

6. The work vehicle according to claim 5, wherein

each of the diesel particulate filter apparatus and the selective catalytic reduction apparatus have a cylindrical outline, and

the diesel particulate filter apparatus and the selective catalytic reduction apparatus are arranged such that a center axis line of the cylindrical outline of the selective catalytic reduction apparatus is higher than a center axis line of the cylindrical outline of the diesel particulate filter apparatus.

7. The work vehicle according to claim 1, wherein

each of the diesel particulate filter apparatus and the selective catalytic reduction apparatus have a cylindrical outline, and

the diesel particulate filter apparatus and the selective catalytic reduction apparatus are arranged such that a center axis line of the cylindrical outline of the selective cata-

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- lytic reduction apparatus is higher than a center axis line of the cylindrical outline of the diesel particulate filter apparatus.
8. The work vehicle according to claim 1, wherein the mounting bracket includes
- a damper mounting section where a damper is attached, and
 - a post-treatment apparatus bracket mounting section where the post-treatment apparatus support bracket is attached,
 - the post-treatment apparatus bracket mounting section being at least as high as the damper mounting section in a vertical direction.
9. The work vehicle according to claim 8, wherein the mounting bracket and the post-treatment apparatus support bracket are formed integrally.
10. The work vehicle according to claim 1, wherein the post-treatment support bracket is fixed onto a rear end of the mounting bracket.
11. The work vehicle according to claim 10, wherein the engine, the selective catalytic reduction apparatus, and the diesel particulate filter apparatus are arranged such that
- a center of the engine in a front and back direction,
 - a center of the selective catalytic reduction apparatus in the front and back direction, and
 - a center of the diesel particulate filter apparatus in the front and back direction are positioned from a front of the vehicle to a rear of the vehicle in order.
12. The work vehicle according to claim 10, wherein each of the diesel particulate filter apparatus and the selective catalytic reduction apparatus have a cylindrical outline, and

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- the diesel particulate filter apparatus and the selective catalytic reduction apparatus are arranged such that
- a center axis line of the cylindrical outline of the diesel particulate filter apparatus and
 - a center axis line of the cylindrical outline of the selective catalytic reduction apparatus
- are orthogonal to the front and back direction of the vehicle.
13. The work vehicle according to claim 10, wherein each of the diesel particulate filter apparatus and the selective catalytic reduction apparatus have a cylindrical outline, and
- the diesel particulate filter apparatus and the selective catalytic reduction apparatus are arranged such that a center axis line of the cylindrical outline of the selective catalytic reduction apparatus is higher than a center axis line of the cylindrical outline of the diesel particulate filter apparatus.
14. The work vehicle according to claim 10, wherein the mounting bracket includes
- a damper mounting section where a damper is attached, and
 - a post-treatment apparatus bracket mounting section where the post-treatment apparatus support bracket is attached,
 - the post-treatment apparatus bracket mounting section being at least as high as the damper mounting section in a vertical direction.
15. The work vehicle according to claim 14, wherein the mounting bracket and the post-treatment apparatus support bracket are formed integrally.

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